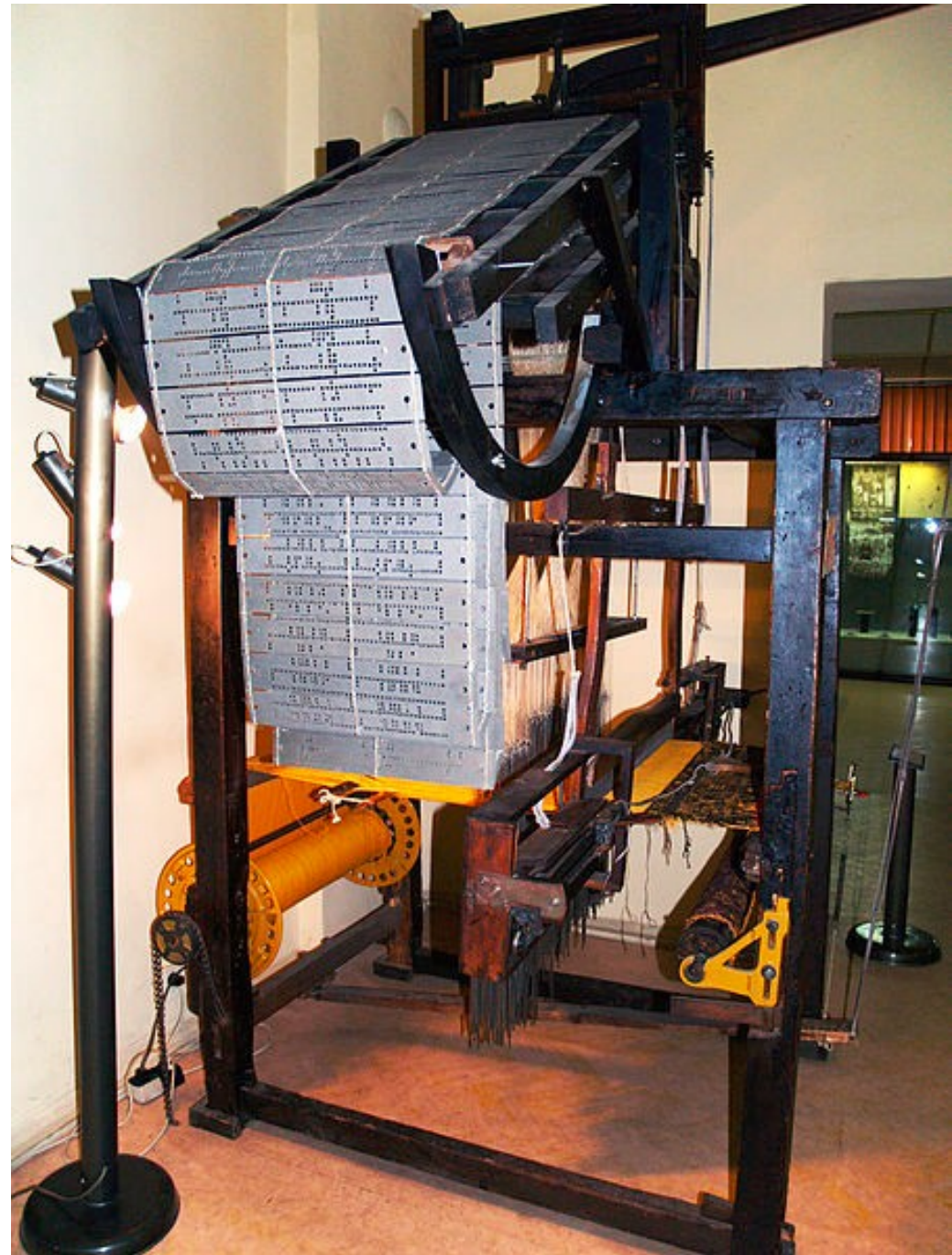
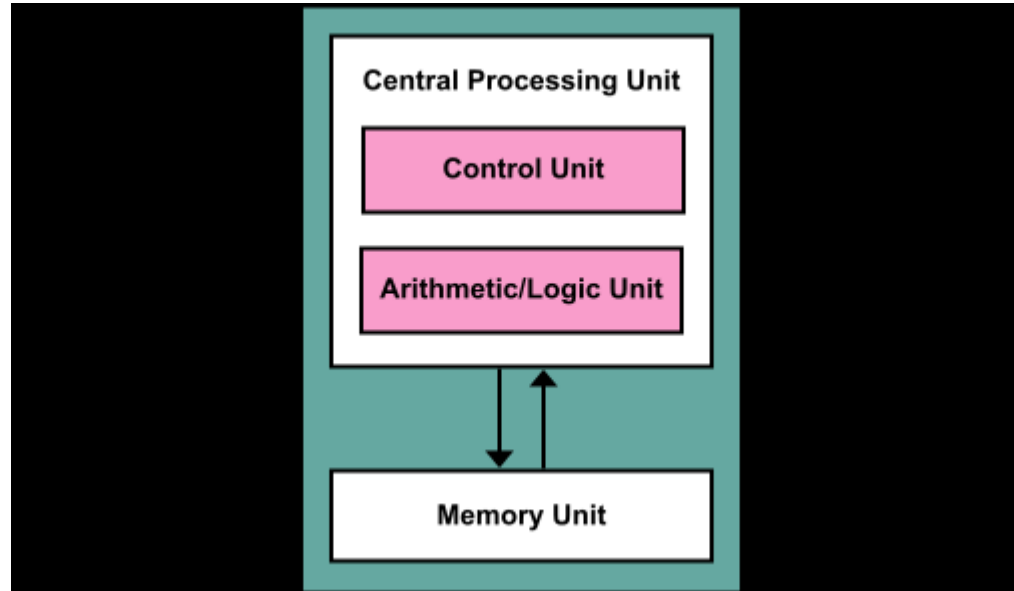


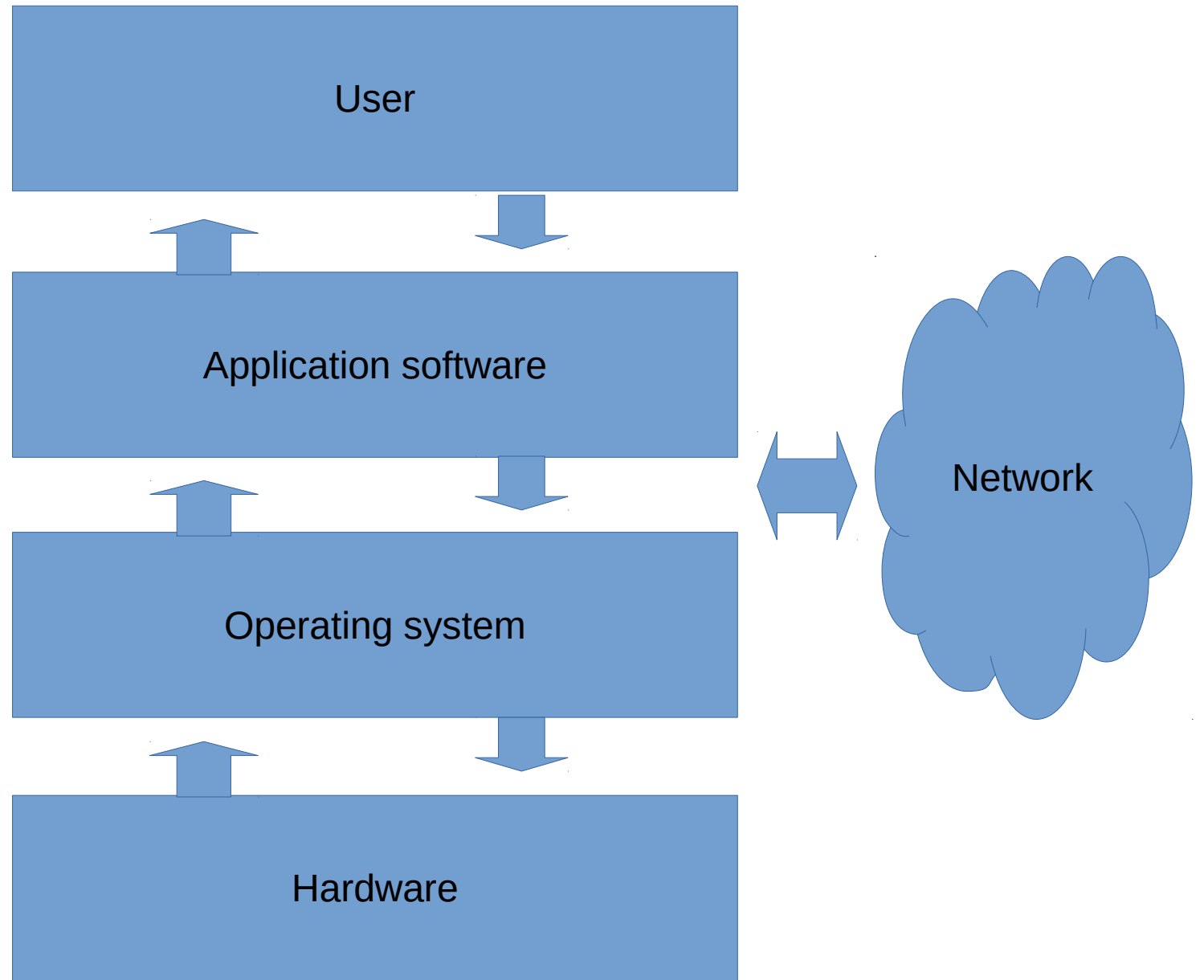
Today's computers

Hardware and software



Computer





Should software be free?
Should software be open?

Free as in free speech
Free as in free beer

Virtual machines

- Abstract hardware (and OS) from application software
- Java VM
- Bytecode – language interpreted by Java VM

Interfaces

- How computers interact with each other and the world
 - Screen
 - Keyboard
 - Printer
 - Network
 - External drives
 - etc.

Computer information

- Bits – 1s and 0s
- 00101101 = 45
- 00101101 = '-'
- 00101101 = ADD
- Long numbers written in 'hex' – base 16:
0xF89E = 1111 1000 1001 1110
- 8 bits = 1 byte
- 1024 bytes = 1 kibibyte
- 1024 kilobytes = 1 megibyte
- 1024 megabytes = 1 gigibyte
- etc

(note – also referred to as kilobyte, megabyte, gigabyte)

Memory addresses

011110



Encoding information

- Characters
 - ASCII 'A' = 65 = 01000001
 - UNICODE 蓝 = 34013 = 1000010011011101
- Addresses
 - 1 byte – 256 possible locations
 - 2 bytes (16-bit) – 65,536 – 64kiB possible locations
 - 4 bytes (32-bit) – 4,294,967,296 – 4GiB possible locations
 - 8 bytes (64-bit) - ... almost unlimited memory locations

Storage...the final frontier

- Commodore 64 – 64 KiB of memory
- Lenovo laptop - ?? GiB of memory
- VAX-11 – 8 MiB of memory
- Dell server – 512 GiB of memory



1.44 Mib

128 Gib

Different types of memory

- RAM (Random Access Memory) – is volatile – needs power to maintain information
- Flash – non-volatile
- Magnetic (disks, tapes) – non-volatile
- Optical (CD, DVD) – non-volatile